

REMARKS

This amendment is respectfully submitted to place subject Application in condition for allowance.

In particular, Claims 1 and 3 to 4 inclusive have been
5 canceled without prejudice, and Claims 2, 5 to 7 inclusive, 9 and 18
have been amended to more clearly point out and distinctly claim
the subject matter of Applicants' novel invention.

Claim 2 has been amended to depend from Claim 5. In Claim
2 the term "catalyst" has been replaced with the expression
10 "catalysts are the same or different to be consistent with Claim 5.
Claims 6 and 7 have been amended to depend from Claim 2.

Claims 5 and 18 have been amended to recite "a petroleum
distillate consisting essentially of material boiling between about
50° C. and about 425° C., including sulfur-containing and nitrogen-
15 containing organic compounds,".

In Claims 5, 9 and 18 the fractionating step recites "at least
one low-boiling blending component consisting of a sulfur-lean,
mono-aromatic-rich fraction boiling below a temperature in the
range of from 260° to 300° C. and having a sulfur content less than
20 about 15 ppm," and a step of recovering by fractional distillation
(Claim 5) with a source of steam (Claims 9 and 18) a crude
hydrotreated high-boiling liquid comprising a mixture of
hydrocarbons and other organic compounds, and having a sulfur
and/or nitrogen content less than the high-boiling feedstock;".
25 Support for this amendment is found in the Specification, for
example, at page 27, lines 1 to 6, and at page 25, line 15 to page 26,
line 2.

In view of the amendments submitted herein, it is the
position of Applicants that the instant Application is in condition for
30 allowance.

Claim Rejections - 35 U.S.C. § 112

In an Office Action mailed December 12, 2002, Claims 1 to 8, 18 to 22, 24, and 25 were rejected under 35 U.S.C. § 112 second paragraph. Applicants respectfully traverse these rejections.

In view of the amendments submitted above, it is the position of Applicants that instant Claims 2, 5 to 12, inclusive, and 18 to 25, inclusive, meet all requirements of 35 U.S.C. § 112.

103 Rejections

In the Office Action mailed December 12, 2002, Claims 1-4, were rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 6,217,748 in the name of Shigeto Hatanaka, Osamu Sadakane, and Hideshi Iki and assigned to Nippon Mitsubishi Oil Corp. (JP), (Hatanaka et al.). Applicants respectfully traverse these rejections, which are moot because Claims 1 and 3 to 4 inclusive have been canceled, and Claim 2 has been amended to dependent from Claim 5.

Claims 5 to 12 and 23 to 25 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No 6,217,748 (Hatanaka et al.) in view of U.S. Patent No. 5,454,933 in the name of David W. Savage, Bal K. Kaul, Gerald D. Dupre, Joseph T. O'Bara, William E. Wales, and Teh C. Ho, and assigned to Exxon Research and Engineering Company (Savage et al.). Applicants respectfully traverse these rejections.

The Hatanaka et al. reference of record describes a four-step hydrodesulfurization (HDS) of a sulfur-containing petroleum hydrocarbon diesel gas oil. The gas oil is catalytically hydrodesulfurized at 300° C. to about 500 ppm sulfur in a first HDS step. Step two is distillation at a cut point temperature in a range of 320 to 340° C. Step three is a second HDS at 320 to 380° C., but

of only the heavy fraction of the distillation. The twice hydrodesulfurized heavy fraction is mixed with the light fraction of the distillation to a sulfur of content of up to 0.01 percent (100 ppm sulfur).

5 By contrast, Applicants' novel process according to instant
Claims 5 and 9 (and 18) recite the step of blending at least portions
of the low-boiling blending component and the treated product to
form fuel for use in internal combustion engines, which fuel
exhibits a suitable flash point of at least 38° C. as measure by ASTM
10 D93, and contains less than 15 ppm sulfur. Critical elements of
these integrated processes which achieve the improved product
include the fractionating step which recites at least one low-boiling
blending component consisting of a sulfur-lean, mono-aromatic-rich
15 fraction boiling below a temperature in the range of from 260° to
300° C. Furthermore, Applicants novel processes include a step of
recovering, by fractional distillation of the hydrogen contacted
high-boiling feedstock, a crude hydrotreated high-boiling liquid
comprising a mixture of hydrocarbons and other organic
20 compounds, and having a sulfur and/or nitrogen content less than
the high-boiling feedstock (Claim 5). Advantageously the fractional
distillation is with a source of steam (Claim 9).

The Savage et al. reference of record describes a six step process for removing sulfur from a distillate stream which includes hydrotreating a distillate stream and directly passing the
25 hydrotreated distillate stream to an adsorption zone containing specified solid adsorbent.

The Savage et al. reference of record alone or in the combination with Hatanaka et al. relied on by Examiner do not disclose or suggest recovering, by fractional distillation of the
30 hydrogen contacted high-boiling feedstock, a crude hydrotreated high-boiling liquid comprising a mixture of hydrocarbons and other

organic compounds, and having a sulfur and/or nitrogen content less than the high-boiling feedstock.

Applicants respectfully request Primary Examiner Griffin to withdraw rejections under 35 U.S.C. § 103 (a) which rely upon the
5 Hatanaka et al. reference alone or in combination with the Savage et al. reference of record.

Additionally, in the Office Action mailed December 12, 2002, Claims 18 to 22 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No 6,217,748 (Hatanaka et al.) in view
10 of U.S. Patent No. 6,228,254 in the name of Lawrence W. Jossens and Curtis L Munson, and assigned to Chevron U.S.A. Inc. (Jossens et al.). Applicants respectfully traverse these rejections.

The Jossens et al. reference of record describes a process for desulfurizing gasoline containing olefins. The process is a mild
15 hydrotreating step followed by an extraction step to reduce sulfur content in gasoline, without reducing the octane number of the gasoline. In Example 5 a partially desulfurized coker pentane/hexane stream was extracted with a saturated caustic-methanol stream. Flash point of hexane is about 9° F./22° C., and
20 flash point of pentane is about negative 57° F/ negative 49° C. The Jossens et al. reference suggests that after extraction the desulfurized coker pentane/hexane stream is suitable for a gasoline product which meets “the requirements for gasoline, which requirements are well documented in Federal and State regulations” (Jossens et al.,
25 column 3, lines 22 to 26).

By contrast, Applicants’ novel process for the production of fuel for use in compression ignition internal combustion engines according to instant Claim 18 recites the step of blending at least portions of the low-boiling blending component and the treated
30 product to form fuel for use in internal combustion engines, which fuel exhibits a suitable flash point of at least 38° C. as measure by

ASTM D93, and contains less than 15 ppm sulfur, i.e. fuel which does not exhibit the requirements for gasoline.

As is well known, octane number is not a requirement of fuel for use in compression ignition internal combustion engines, i.e. 5 diesel fuels, jet fuels and kerosenes.

The process according to claim 18 wherein the immiscible liquid comprises an aqueous solvent containing an alkali metal hydroxide selected from the group consisting of sodium, potassium, barium, calcium and magnesium hydroxide to beneficially provide 10 fuel which exhibits a suitable flash point of at least 49° C.(Claim 19).

It is the position of Applicants that the Jossens et al. reference of record is not relevant to Applicants novel process for the production of fuel, having a sulfur content less than about 15 ppm, for use in compression ignition internal combustion engines.

15 Applicants respectfully request Primary Examiner Griffin to withdraw rejections under 35 U.S.C. § 103 (a) which rely upon the Hatanaka et al. reference alone or in combination with the Jossens et al. reference of record.

Applicants agree with Examiner that the references of 20 record but not applied do not disclose or suggest Applicant's novel subject matter which includes, for example, providing a refinery distillate comprising a mixture of hydrocarbons, sulfur-containing and nitrogen-containing organic compounds, the mixture having a sulfur content up to about 25,000 ppm and 25 consisting essentially of material boiling between about 200° C. and about 425° C.; hydrotreating the refinery distillate with a source of hydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated distillate, to 30 recover a hydrotreated distillate having a sulfur content less than about 500 ppm; fractionating the hydrotreated distillate by

distillation to provide at least one low-boiling blending component consisting of a sulfur-lean, mono-aromatic-rich fraction boiling below a temperature in the range of from 260° to 300° C. and having a sulfur content less than about 15 ppm, and a

5 high-boiling feedstock consisting of a sulfur-rich, mono-aromatic-lean fraction containing the balance of the sulfur; contacting the high-boiling feedstock with a gaseous source of dihydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst which exhibits a capability to enhance the incorporation

10 of hydrogen into one or more of the sulfur-containing organic compounds and under conditions suitable for hydrogenation of one or more of the sulfur-containing organic compounds; recovering by fractional distillation with a source of steam a crude hydrotreated high-boiling liquid comprising a mixture of

15 hydrocarbons and other organic compounds, and having a sulfur and/or nitrogen content less than the high-boiling feedstock; treating at least a portion of the recovered liquid with a solid sorbent an ion exchange resin, and/or a suitable immiscible liquid containing a solvent or a soluble basic chemical compound for a

20 time sufficient to reduce the sulfur content of the liquid phase and obtain a product having a sulfur content less than about 10 ppm; and blending at least portions of the low-boiling blending component and the treated product to form fuel for use in internal combustion engines, which fuel exhibits a suitable flash

25 point of at least 38° C. as measure by ASTM D93, and contains less than 15 ppm sulfur.

Base on the amendments submitted herein, Applicants urge that Claims 1 to 12, inclusive, and 18 to 25, inclusive, all claims now presented, are in condition for allowance. Applicants respectfully request Primary Examiner Griffin to pass subject application for allowance.

Do not hesitate to contact Frederick S. Jerome whose telephone number is (630) 832-7974 (FAX (630) 832-7976) if additional

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assistance is needed regarding this paper or earlier papers for Applicants.

Applicants and their undersigned Attorney appreciate the attention and further consideration of this matter by Examiner
5 Griffin.

Respectfully submitted,



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Version of Amended Claims with Markings
to Show Changes Made

2. (Twice Amended) The process for the production of fuel or blending component of fuels according to claim 5 [1] wherein 5 the hydrogenation catalysts are the same or different and [catalyst] comprises at least one active metal, selected from the group consisting of the *d*-transition elements, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst.

10 5. (Twice Amended) A process for the production of refinery transportation fuel or blending components for refinery transportation fuel having a sulfur content less than about 15 ppm, which process comprises:

15 hydrotreating a petroleum distillate consisting essentially of material boiling between about 50° C. and about 425° C., including sulfur-containing and nitrogen-containing organic compounds, and having a sulfur content up to about 25,000 ppm, by a process which includes reacting the petroleum distillate with a source of hydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst 20 to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated petroleum distillate, thereby producing a hydrotreated petroleum distillate having a sulfur content less than about 500 ppm;

25 fractionating the hydrotreated petroleum distillate by distillation to provide at least one low-boiling blending component consisting of a sulfur-lean, mono-aromatic-rich fraction boiling below a temperature in the range of from 260° to 300° C. and having a sulfur content less than about 15 ppm, and a high-boiling feedstock consisting of a sulfur-rich, mono-aromatic-lean fraction containing the balance of the sulfur;

30 contacting the high-boiling feedstock with a gaseous source of dihydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst which exhibits a capability to enhance the incorporation of hydrogen into one or more of the sulfur-containing

and/or nitrogen-containing organic compounds and under conditions suitable for hydrogenation of one or more of the sulfur-containing and/or nitrogen-containing organic compounds;

5 recovering by fractional distillation a liquid comprising a mixture of hydrocarbons and other organic compounds, and having a sulfur and/or nitrogen content less than the high-boiling feedstock;

treating at least a portion of the recovered liquid with a solid sorbent for a time sufficient to reduce the sulfur content of the liquid phase and thereby obtain a product having a sulfur content less than
10 about 15 ppm : and

blending at least portions of the low-boiling blending component and the treated product to form fuel for use in internal combustion engines, which fuel exhibits a suitable flash point of at least 38° C. as measured by ASTM D93, and contains less than 15 ppm sulfur.

15 6. (Once Amended) The process for the production of fuel or blending component of fuels according to claim 2 [5] wherein the hydrotreating of the petroleum distillate employs at least one bed of hydrogenation catalyst comprising one or more metals selected from the group consisting of cobalt, nickel, molybdenum and tungsten.

20 7. (Once Amended) The process for the production of fuel or blending component of fuels according to claim 2 [5] wherein the contacting the high-boiling feedstock with a gaseous source of dihydrogen employs at least one bed of hydrogenation catalyst comprising one or more metals selected from the group consisting of nickel, molybdenum and tungsten.

9. (Twice Amended) A process for the producing a refinery transportation fuel or blending components for refinery transportation fuel having a sulfur content less than about 15 ppm, which process comprises:

30 providing a refinery distillate comprising a mixture of hydrocarbons, sulfur-containing and nitrogen-containing organic compounds, the mixture having a sulfur content up to about 25,000

ppm and consisting essentially of material boiling between about 200° C. and about 425° C.;

5 hydrotreating the refinery distillate with a source of hydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated distillate, to recover a hydrotreated distillate having a sulfur content less than about 500 ppm;

10 fractionating the hydrotreated distillate by distillation to provide at least one low-boiling blending component consisting of a sulfur-lean, mono-aromatic-rich fraction boiling below a temperature in the range of from 260° to 300° C. and having a sulfur content less than about 15 ppm, and a high-boiling feedstock consisting of a sulfur-rich, mono-aromatic-lean fraction containing the balance of the sulfur;

15 contacting the high-boiling feedstock with a gaseous source of dihydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst which exhibits a capability to enhance the incorporation of hydrogen into one or more of the sulfur-containing organic compounds and under conditions suitable for hydrogenation of one or more of the sulfur-containing organic compounds;

20 recovering by fractional distillation with a source of steam a crude hydrotreated high-boiling liquid comprising a mixture of hydrocarbons and other organic compounds, and having a sulfur and/or nitrogen content less than the high-boiling feedstock;

25 treating at least a portion of the recovered liquid with a solid sorbent an ion exchange resin, and/or a suitable immiscible liquid containing a solvent or a soluble basic chemical compound for a time sufficient to reduce the sulfur content of the liquid phase and obtain a product having a sulfur content less than about 10 ppm; and

30 blending at least portions of the low-boiling blending component and the treated product to form fuel for use in internal combustion engines, which fuel exhibits a suitable flash point of at least 38° C. as measured by ASTM D93, and contains less than 15 ppm sulfur.

18. (Once Amended) A process for the production of fuel, having a sulfur content less than about 15 ppm, for use in compression ignition internal combustion engines, which process comprises:

5 hydrotreating a petroleum distillate consisting essentially of material boiling between about 50° C. and about 425° C., including sulfur-containing and nitrogen-containing organic compounds, and having a sulfur content in a range from about 0.1 percent by weight to about 0.9 percent by weight of elemental sulfur and a total nitrogen content in a range from about 5 ppm to about 900 ppm, by a process
10 which includes reacting the petroleum distillate with a source of hydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated petroleum distillate, thereby producing a hydrotreated petroleum distillate having a sulfur content
15 less than about 500 ppm;

20 fractionating the hydrotreated petroleum distillate by distillation to provide at least one low-boiling blending component consisting of a sulfur-lean, mono-aromatic-rich fraction boiling below a temperature in the range of from 260° to 300° C. and having a sulfur content less than about 15 ppm, and a high-boiling feedstock consisting of a sulfur-rich, mono-aromatic-lean fraction containing the balance of the sulfur;

25 contacting the high-boiling feedstock with a gaseous source of dihydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst which exhibits a capability to enhance the incorporation of hydrogen into one or more of the sulfur-containing and/or nitrogen-containing organic compounds and under conditions suitable for hydrogenation of one or more of the sulfur-containing and/or nitrogen-containing organic compounds;

30 recovering by fractional distillation with a source of steam a crude hydrotreated high-boiling liquid comprising a mixture of hydrocarbons and other organic compounds, and having a sulfur and/or nitrogen content less than the high-boiling feedstock;

treating at least a portion of the recovered liquid with an ion exchange resin and/or a suitable immiscible liquid containing a

solvent or a soluble basic chemical compound, to obtain a treated product having a sulfur content less than about 15 ppm; and

- blending at least portions of the low-boiling blending component and the treated product to form a fuel for use in
5 compression ignition internal combustion engines, and wherein the fuel exhibits a suitable flash point of at least 38° C. as measured by ASTM D93, and contains less than 15 ppm sulfur.